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Received 9 July 2003; accepted 14 March 2004

*J. Raptor Res.* 38(3):275–277

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## A LOCAL CONCENTRATION OF SNOWY OWLS ON THE YUKON-KUSKOKWIM DELTA IN SUMMER 2000

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KEY WORDS: *Snowy Owl*; *Bubo scandiacus*; Yukon-Kuskokwim Delta; Yukon Delta National Wildlife Refuge, Alaska.

we describe the magnitude of this unusual local summer concentration.

### STUDY AREA

Snowy Owls (*Bubo scandiacus*) are nomadic and irregular summer visitors in Alaska (Gabrielson and Lincoln 1959, Parmalee 1992), particularly south of their stronghold on the northern arctic-coastal plain (e.g., Barrow). Near Hooper Bay on the Yukon-Kuskokwim Delta (YKD) in southwestern Alaska, Snowy Owls nested commonly (ca. 40 nests) in 1924 (Murie 1929). Despite the extensive activities of biologists in the decades following (particularly since the 1970s), concentrations comparable to those in 1924 have never been reported, and breeding records are virtually nonexistent. The only subsequent report of large numbers of Snowy Owls on the YKD was in 1963, when perhaps as many as several dozen (some nesting) were detected at the eastern end of Nelson Island (Nyctea Hills; J. King pers. comm.).

In summer 2000, Yukon Delta National Wildlife Refuge (YDNWR) personnel flew a series of aerial surveys to document distribution and abundance of fall-staging Bristle-thighed Curlews (*Numenius tahitiensis*). During these surveys, Snowy Owls were recorded regularly. In this paper,

The study area was located on the coastal YKD south of Nelson Island (Fig. 1). The roughly triangular area was bounded on the north by the 60°30' parallel, on the southwest by the Bering Sea, on the southeast by the Kinak River, and on the east by Dall Lake (Fig. 1). Elevations ranged from sea level to 135 m above sea level (masl) at the summit of Tern Mountain; however, more than 90% of the study area was <10 masl. This 2545-km<sup>2</sup> area included four major vegetation associations dominated by a variety of subarctic tundra types. North of Tern Mountain, a 5-km wide band of low wet graminoid meadows was immediately adjacent to the shoreline. Inland of these coastal meadows, there was a wide band of slightly higher tundra, varying in width from 5–30 km. This habitat was characterized by a series of low, ancient beach ridges, a high density of medium-sized lakes, and a slightly more heterogeneous mosaic of plant communities. Although graminoid meadows still dominated, more mesic communities, including graminoid tussock dwarf shrub peatland and lichen dwarf shrub peatland occurred here. Together, these two major habitats comprised the coastal zone of the study area. Farther inland, particularly east of Kegum Kagati Lake, and extending to Dall Lake (Fig. 1), large lakes were prevalent, and the three previously described plant communities were more evenly distributed. Finally, six scattered uplands comprised the only vegetation association in the study area >10 masl. Five of these exceeded 30 masl, and all five supported communities of dwarf shrub heath. These latter two habitats comprised the inland/upland zone of the study area

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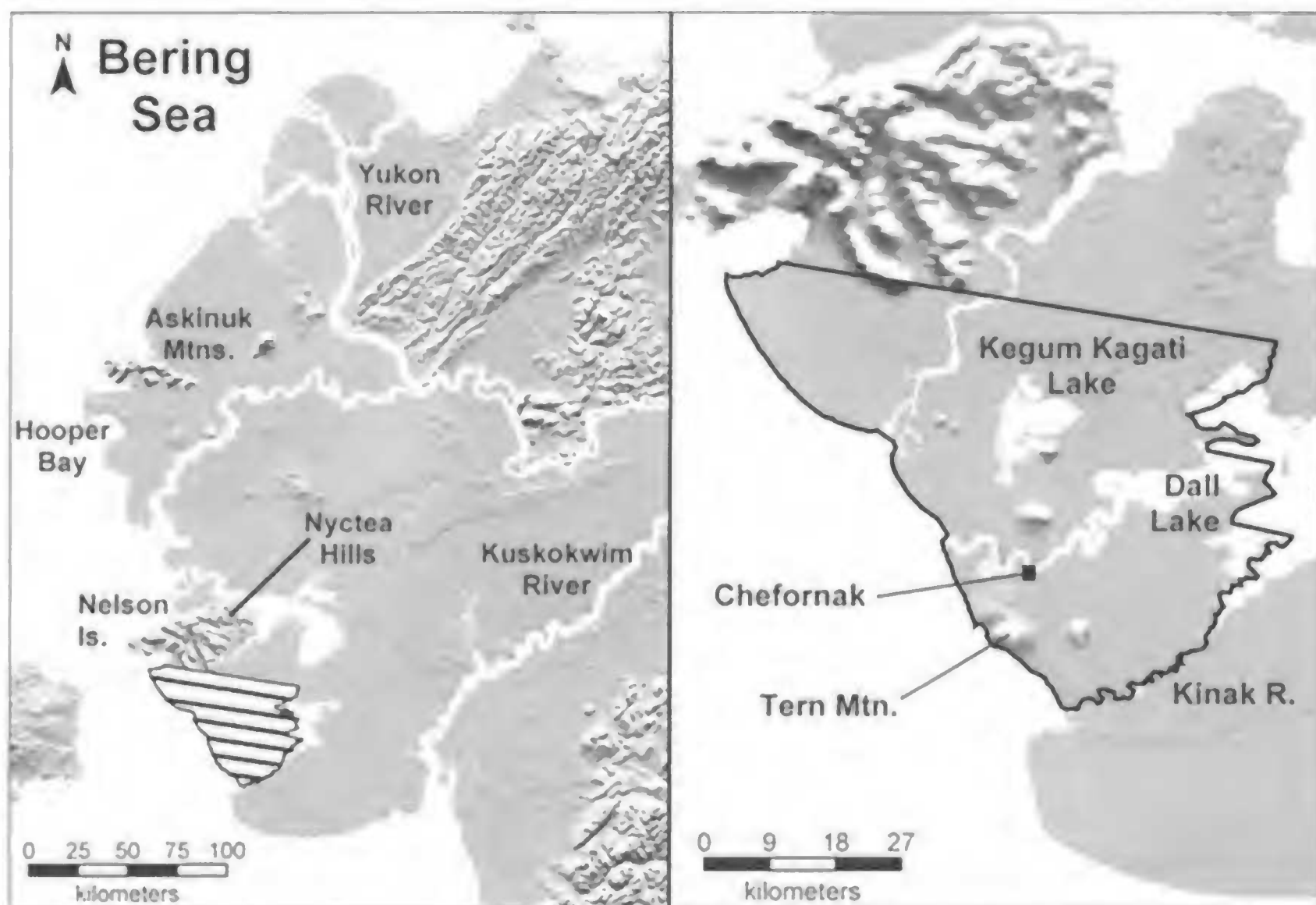


Figure 1. Yukon-Kuskokwim Delta in southwest Alaska (left panel; Snowy Owl survey area hatched) and detail of Snowy Owl survey area (right panel), summer 2000.

The coastal and inland/upland zones included 36% and 64% of the study area, respectively.

#### METHODS

We established 34 parallel transects of unequal length spaced 1.6 km apart in the study area in an east-west orientation. Five aerial surveys, spaced 2 wk apart, were conducted between 10 July and 14 September 2000. Surveys were flown in an Aviat Husky A-1B (on floats) at ca. 50 m above ground level and at ca. 90 kt. All 34 transects (total length = 1618 km) were flown in survey periods 1, 2, and 5, while only the 17 even-numbered transects (total length = 779 km) were flown for surveys 3 and 4. On each survey the rear-seat observer scanned a 300-m swath adjacent to the north-facing side of the aircraft (estimated by tape marked on the wing struts). Owl detections were recorded either into a tape recorder (along with time elapsed to calculate position) or Global Positioning System receiver. Owl detections were categorized as either "on transect" (i.e., within 300 m north of the aircraft) or "off transect" (i.e., all other observations, including those by pilot). Abundance estimates (and 95% confidence intervals) were derived exclusively from "on-transect" detections for each period (Cochran 1963, Caughley 1977). Abundance estimates were based on the assumption that all owls were detected in the 300-m sam-

ple area north of the transect lines. Owls were aged as adult or hatch-year on the basis of plumage differences (König et al. 1999).

#### RESULTS

Total detections (on transects) of Snowy Owls during survey periods ranged from 15–27 individuals, with the highest estimated number of Snowy Owls in the study area in survey period 4 (Table 1). Owls were not evenly detected throughout the study area; densities were markedly higher in the southern half, particularly concentrated southeast of Chefornak. Owls were also more likely to be detected in the inland (rather than the coastal) portion of the study area (on-transect observations:  $N = 105$ ,  $\chi^2 = 10.86$ ,  $df = 1$ ,  $P = 0.001$ ; off-transect:  $N = 28$ ,  $\chi^2 = 4.91$ ,  $df = 1$ ,  $P = 0.028$ ). Hatch-year birds, including at least one apparently attended by an adult, were detected in the two latter surveys (i.e., four owls during survey 4, one during survey 5). At least two possible nest sites (i.e., 3–5-m diameter circles of likely molted feathers) were recorded, but we did not land the plane to confirm these nests.

Table 1. Population estimates and 95% Confidence Intervals (CI) of Snowy Owls south of Nelson Island, Yukon-Kuskokwim Delta, AK, summer 2000.

DATES	TOTAL LENGTH OF TRANSECTS (km)	ACTUAL NO. OF OWLS DETECTED	ESTIMATE ± (95% CI)
10–12 July	1618	15	79 ± 48
24–25 July	1618	25	131 ± 59
7–8 August	779	17	185 ± 86
21–22 August	779	21	229 ± 143
11–14 September	1618	27	142 ± 63

DISCUSSION

While small numbers of Snowy Owls are observed regularly on the YKD in the nonbreeding season, the numbers observed in summer 2000 represent the largest concentration reported on the Delta in almost 40 yr. Since at least 1984, regional arvicoline rodent population highs on the YKD have occurred on a 4-yr cycle. Higher breeding densities of rodent-eating raptors, including Rough-legged Hawks (*Buteo lagopus*) and Short-eared Owls (*Asio flammeus*), are frequently associated with these peaks in rodent numbers (YDNWR unpubl. data). The year 2000 was no exception, with arvicoline rodents again showing regional population highs. Locally high breeding densities of Rough-legged Hawks and Short-eared Owls were recorded north of our study area in the Askinuk Mountains and in the coastal lowlands of the central YKD, respectively (B. McCaffery and J. Morse unpubl. observations). However, Snowy Owls were absent from these areas (T. Bowman pers. comm.). We do not know what habitat or prey factors may have limited the Snowy Owl concentration to the area south of Nelson Island, nor do we know why owls were more abundant in the southern and inland portions of our study area.

While local nesting was not definitively confirmed, the detection of volant juveniles, as well as a couple of possible nest sites, suggests perhaps the southernmost mainland nesting for Snowy Owls in Alaska since 1973 (i.e., Goodnews and Chagvan bays; Petersen et al. 1991). Failure to detect juveniles until the final two surveys might be partly explained by the species' lengthy (ca. 50 d; Parmalee 1992) and cryptic brood-rearing period. Appearance of volant young on 21 August suggests laying in late May–early June, which is consistent with Brandt's (1943)

observations in 1924. In spite of the abundance of adults present in 2000, it is unlikely that the magnitude of breeding rivaled that observed at Hooper Bay in 1924 (Murie 1929).

RESUMEN.—La concentración de verano mas grande reportada de el buho nival (*Bubo scandiacus*) en 40 años en el delta del Yukon-Kuskokwim fue documentada al sur de la Isla Nelson en el 2000. Los estimativos de abundancia de cinco monitoreos aéreos oscilaron entre 79–229 individuos en una área de estudio de 2545 km<sup>2</sup> cuadrados. La presencia de varios búhos juveniles sugieren la reproducción en el área de estudio.

[Traducción de César Márquez]

ACKNOWLEDGMENTS

We thank the numerous researchers, pilots, and observers that have worked on the YKD for their observations and recollections, particularly T. Bowman, V. Byrd, B. Conant, C. Dau, R. Gill, D. Groves, J. King, C. Lensink, M. Lindberg, J. Morse, J. Sedinger, and M. Wege. J. Bednarz, D. Evans, and T. Swem reviewed the manuscript. R. Stehn provided valuable statistical assistance and C. Knight assisted with the figure.

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Received 23 September 2002; accepted 3 June 2004